Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Vol. 40 No. 5

BULLETIN

OF THE

TORREY BOTANICAL CLUB

MAY, 1913

A taxonomic study of the Pteridophyta of the Hawaiian Islands—III

WINIFRED J. ROBINSON

(WITH PLATES 9–12)

19. POLYPODIUM L. Sp. Pl. 1082. 1753

A cosmopolitan genus, including ferns of every habitat. Rootstock creeping; leaves articulate; blades various, mostly simple or pinnate; veins free or occasionally anastomosing; sori orbicular, dorsal on the veins, non-indusiate.

Type species: *Polypodium vulgare* L.

Leaves simple to deeply pinnatifid, not bearing reddish, resinous glands beneath.
  Leaves simple.
    Margin entire or very slightly undulate.
      Rootstock creeping, 5–8 mm. in diameter, the scales light brown; leaves 8–20 cm. × 7.5–10 mm.
        Leaves stalked, pubescent with numerous reddish brown hairs 2–3 mm. long; margin entire; sori inframedial. — *P. Hookeri.*
        Leaves sessile, pubescent with scattered whitish hairs less than 1 mm. long; margin slightly undulate; sori supramedial. — *P. Knudsenii.*
      Rootstock erect or creeping, less than 5 mm. in diameter, the scales dark brown; leaves 5–7 cm. × 2–5 mm.
        Rootstock erect, rather stout; leaves subsessile, linear-lanceolate, entire; sori oval, numerous. — *P. pumilum.*
        Rootstock creeping, wiry; leaves stalked, linear, slightly undulate; sori round, few, distant. — *P. pseudogrammitis.*

[The BULLETIN for April 1913 (40: 137-192. *pl. 3–8*) was issued May 9.]

Margin crenate to serrate, at least in the lower part; rootstock erect; leaves 10–15 cm. × 2–4 mm.

Margin crenate or dentate from base to apex; sori oval, alternate, supramedial on serrations. *P. Haaliliolanum.*

Margin sinuately pinnatifid below, subentire in apical third; sori oval, inframedial. *P. Saffordii.*

Leaves pinnatifid.

Basal segments reduced to a wing along the midrib; lower surface and margin marked by scattered, brownish glandular hairs.

Leaves elliptic-lanceolate to elliptic-caudate, 8–15 cm. × 1–2.5 cm.; sori nearly covering leaf tissue from costa to margin. *P. sarmentosum.*

Leaves linear to narrowly oblanceolate, 15–25 cm. × 1.5–2 cm.; sori inframedial. *P. Adenophorus.*

Basal segments scarcely reduced; leaves ovate-oblong, segments varying from linear to lanceolate with narrow sinuses between them, to oblong and obtuse with broad sinuses; pellucid lines between the veins. *P. pellucidum.*

Leaves bipinnatifid to deeply tripinnatifid, bearing numerous, reddish, resinous glands beneath.

Leaves bipinnatifid.

Leaves linear, 5–15 cm. × 5–7.5 mm., pinnae divided into 2 or 3 segments. *P. hymenophylloides.*

Leaves not linear; pinnae divided into 6 to 15 segments.

Leafstalk 0.5 mm. in diameter; blades oblong-ovate, 3.5–5 cm. × 1–2 cm.; pinnae compact. *P. abietinum.*

Leafstalk 1–2 mm. in diameter; blades more than 10 cm. long.

Leaves subcoriaceous, blades ovate-lanceolate; pinnae oblong, 20–30 cm. × 6–8 cm.; segments linear; sori narrower than the segments. *P. Hillebrandii.*

Leaves chartaceous, blades elliptic-lanceolate to elliptic-caudate, 10–35 cm. × 2–5 cm., pinnae lanceolate; segments oblanceolate to spatulate; sori as broad as the segments. *P. tamariscinum.*

Leaves tripinnatifid; pinnae 15–25 cm. × 2–3 cm.; segments spatulate; sori as broad as the segments. *P. Gaudichaudii.*

POLYPODIUM HOOKERI Brack. Fil. U. S. Expl. Exp. 4. 1854

Polypodium setigerum Hook. & Arn. Bot. Beech. 103. 1832. Not Blume.

Grammitis setigera J. Sm. Hist. Fil. 181. 1875.

TYPE LOCALITY: Oahu.

DISTRIBUTION: Polynesia, Hawaiian Islands.

ILLUSTRATION: Hook. & Arn. Bot. Beech. *pl. 21. f. a.* 1832.

SPECIMENS EXAMINED: Hawaii, *Mann & Brigham 482* N; *Robinson 201* V; Maui, *Robinson 336* V; *338* V; *352* V; Oahu, *Heller 2245* C, N; *Lichtenthaler* N; Hawaiian Islands, *Baldwin 81* C, N; *Baldwin* B; *Hillebrand* B; ex Herb. Underwood C; *Hillebrand* N.

This is closely allied to *P. setosum* (Blume) Presl, according to Copeland, Polypodiaceae of the Philippine Islands, Bur. Gov. Lab. Publ. **21**: 119. 1905.

POLYPODIUM KNUDSENII Hieron. Hedwigia **44**^{2}: 79. 1905

Polypodium samoense var. *glabra* Hilleb. Fl. Haw. Is. 554. 1888. Not *P. glabrum* Roxb.

Polypodium samoense Christ in Engler, Bot. Jahrb. **23**: 358. 1896, in part. Not Baker.

TYPE LOCALITY: Kauai, Hawaiian Islands.

DISTRIBUTION: On trees, Kauai, Hawaiian Islands.

SPECIMENS EXAMINED: Kauai, *Baldwin 17* B; *Heller 2708* B; C, K, N; *Knudsen 7* B; *Robinson 405* V; *440* V; *453* V; *826* V; *836* V.

Hieronymus (Hedwigia **44**^{2}: 79. 1905) distinguishes *P. Knudsenii* from *P. samoense* by the broader, yellow rather than ferruginous, scales of the rhizome; the fewer, smaller hairs upon the leafstalk; the thicker texture and more pointed apex of the leaf; the less evident veins; the larger size of the sori and their greater proximity to the margin of the leaf.

Polypodium pumilum sp. nov.

Rootstock short, erect, less than 1 mm. in diameter, covered with dark brown, linear-lanceolate scales 1–2 mm. long and 0.3–0.5 mm. broad at the base, with 6–10 rows of cells in the broadest part; roots numerous; leaves 3–5, simple, nearly sessile, cespitose, linear-oblanceolate, obtuse or bluntly acute at apex, narrowed gradually at the base, 4–7 cm. long, 3–5 mm. wide, the margin subentire, the midrib green, prominent; veins forked once about 2 mm. from the midrib; sori oblong, 1.5–2 mm. long by 1–1.5 mm. broad; sporangia flattened laterally, the annulus of 10–12 cells; spores yellow, tetrahedral, 0.040 mm. in diameter, very minutely tuberculate. [FIG. 1.]

Type collected on Oahu, 1000 m. elevation, 1890, by D. D. Baldwin, distributed by D. C. Eaton as *P. sessilifolium* (herb. N. Y. Bot. Gard.).

Known only from the type locality.

The present species differs from *P. Knudsenii* Hieron. in its smaller size; in the size of the scales, which in the latter are 3–4 mm. long and 0.5–0.8 mm. wide, with 10–20 rows of cells in the broadest part; and in the smooth margin of the leaf in contrast with the hairy margin of *P. Knudsenii.*

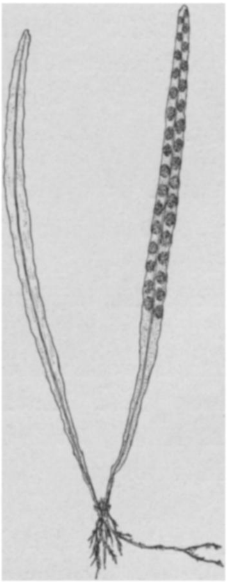


FIG. 1. *Polypodium pumilum*, natural size.

POLYPODIUM PSEUDOGRAMMITIS Gaud. Voy. Freyc. Bot. 345. 1828

Grammitis tenella Kaulf. Enum. 84. 1824. Not Forster.

Polypodium Kaulfussii Presl, Tent. Pterid. 178. 1836.

TYPE LOCALITY: Oahu.

DISTRIBUTION: On trees, common; Hawaiian Islands.

ILLUSTRATIONS: Hook. & Arn. Bot. Beech. *pl. 21.* 1832; Kunze, Anal. Pterid. *pl. 9. f. 1.* 1837.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B, C; *Robinson 236* V; *260* V; *275* V; Oahu, *Heller 2215* C; *Macrae* B; *Robinson 2* V; *9* V; *45* V; *119* V; Kauai, *Robinson 446* V; Hawaiian Islands, *Baldwin 32* B; *83* B, C; *Gaudichaud* B; *Wilkes Expedition* B, C.

POLYPODIUM HAALILIOLANUM Brack. Fil. U. S. Expl. Exp. 5. 1854

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: On tree trunks above 600 m. elevation, Hawaiian Islands; rare.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 1. f. 4.* 1854.

SPECIMENS EXAMINED: Hawaii, *Robinson 601* V; Oahu, *Hillebrand* B; *Mann & Brigham 178* N; *Wilkes Expedition* N; Kauai, *Lichtenthaler* N; Hawaiian Islands, *Baldwin 86* B; C; *Hillebrand* C.

Hieronymus (Hedwigia **44**^{2}: 86. 1905) reduces *Polypodium Haaliliolanum* to *Polypodium subpinnatifidum* Blume, but the type of the latter at Berlin has subpinnatifid lobes and acute sinuses, while the leaves of the Hawaiian plant are sinuato-crenate throughout. The sporangia of *Polypodium Haaliliolanum* are smooth, while those of *Polypodium subpinnatifidum* are setose.

POLYPODIUM SAFFORDII Maxon, Am. Fern Jour. **2**: 19. 1912

Polypodium minimum Brack. Fil. U. S. Expl. Exp. 5. *pl. 1. f. 3.* 1854. Not Aublet.

Polypodium serrulatum var. *lata* Luerssen, in Wawra, Flora **58**: 422. 1875.

Polypodium serrulatum Hilleb. Fl. Haw. Is. 553. 1888. Not Mett.

TYPE LOCALITY: Oahu.

DISTRIBUTION: Common on trees above 600 m. elevation, Hawaiian Islands.

ILLUSTRATIONS: Brack. Fil. U. S. Expl. Exp. *pl. 1. f. 3.* 1854; Maxon, Am. Fern Jour. **2**: 19. 1912.

SPECIMENS EXAMINED: Hawaii, *Lichtenthaler* N; *Robinson 600* V; Oahu, *Heller 2905* (type) N, (cotype) C; *Mann & Brigham 550* N; *Robinson 521* V; *Wilkes Expedition* N; Kauai, *Hillebrand 123* B; Hawaiian Islands, *Baldwin 85* B, C; *Bishop 81* B; *Johnson* B; ex Herb. Mt. Holyoke College B; *Wilkes Expedition* C.

POLYPODIUM SARMENTOSUM Brack. Fil. U. S. Expl. Exp. 8. 1854

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Common on rocks and decayed wood, Hawaiian Islands.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 2. f. 3.* 1854.

SPECIMENS EXAMINED: Hawaii, *Robinson 203* V; Maui, *Bailey* C; *Robinson 356* V; Oahu, *Forbes* BM; *Heller 2353* C, N; *Lichtenthaler* N; *Mann & Brigham 200* N; *Robinson 1* V; *5* V; *46* V; *67* V; *117* V; *Safford 889* N; Kauai, *Robinson 856* V; *418* V; Hawaiian Islands, *Baldwin 82* C, N; *Wilkes Expedition* C; ex Herb. John Donnell Smith N.

POLYPODIUM ADENOPHORUS Hook. & Arn. Bot. Beech. 104. 1832

Adenophorus pinnatifidus Gaud. Voy. Freyc. Bot. 365. 1829. Not Gilib.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: On tree trunks in the forests above 600 m. elevation.

ILLUSTRATION: Hook. & Arn. Bot. Beech. *pl. 22.* 1832.

SPECIMENS EXAMINED: Oahu, *Lichtenthaler* N; *Mann & Brigham 283* N; Kauai, *Knudsen* B; *Robinson 851* V; Hawaiian Islands, *Baldwin 88* B, C; *Wilkes Expedition* C, N; ex Herb. John Donnell Smith N.

POLYPODIUM PELLUCIDUM Kaulf. Enum. 101. 1824

Polypodium myriocarpum Hook. Ic. Pl. *pl. 84.* 1837.

Polypodium hawaiiense Underw. in Heller, Minn. Bot. Stud. 1: 784. 1897.

Polypodium Helleri Underw. in Heller, Minn. Bot. Stud. 1: 785. 1897.

Polypodium vulgare Christ, Farnkr. Erde 83. 1909.

TYPE LOCALITY: Oahu.

DISTRIBUTION: On ground and on tree trunks, at 300–2,000 m. elevation; Hawaiian Islands.

ILLUSTRATIONS: Hook. Ic. Pl. *pl. 84.* 1837; *pl. 944, 945.* 1854.

SPECIMENS EXAMINED: Hawaii, *Dale* C; *Robinson 144* V; *254* V; *267* V; *Wilkes Expedition* C; Maui, *Bishop 83* B; *84* B; *Finsch 11* B; *60* B; *Robinson 316* V; *324* V; *333* V; Molokai, *Hillebrand* B; Oahu, *Chamisso* B; *Forbes 1017* BM; *Heller 2075* C; *Robinson 7* V; Kauai, *Forbes 268* BM; *Heller 2602* C; *2634* C; *Hillebrand 54* B; *Knudsen 55* B; *56* B; *Robinson 403* V; *482* V; Hawaiian Islands, *Baldwin 89a* B; *89c* B; *89* C; *Bailey* C; *Douglas 69* B, C; *Gaudichaud* B; *Lydgate* B; *Wilkes Expedition* B, C.

Polypodium pellucidum is extremely polymorphous, as is shown by the several nominal species that have been segregated at different times. Kaulfuss's type in the Berlin herbarium is very coriaceous and has the intermediate veinlike striations mentioned by this author. The pinnae are rather acute, 4–5 cm. long, with crenate-undulate margins. Divergences from this are seen in: (1) *P. Helleri* Underw. (type *Heller 2602*) with longer thinner pinnae; a single incomplete leaf has greatly elongated pinnae; (2) *P. hawaiiense* Underw. with broader (1.5 cm.), shorter (3–4.5 cm.), rounded pinnae, Hillebrand's var. *opacum* from Molokai; (3) *P. myriocarpum* (Hook. Ic. Pl. 1: *pl. 84*) apparently a monstrous form with great variability in the pinnae of the same leaf; (4) a form still more common in collections, which has close or spaced pinnae ranging from rounded to pointed on the same leaf. Near the extinct craters, about a mile from the Volcano House, Hawaii, the leaves are folded ventrally upon the midrib. A field study of the range of variations of the species would form an interesting local problem.

POLYPODIUM HYMENOPHYLLOIDES Kaulf. Enum. Fil. 118. 1824

Amphoradenium minutum Desv. Prod. 336. 1827.

Adenophorus hymenophylloides Hook. & Grev. Ic. Fil. *pl. 176.* 1829.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Rare, on trees at elevations of 1,000–1,600 m., Hawaiian Islands.

ILLUSTRATIONS: Gaud. Voy. Freyc. Bot. *pl. 8.* Hook. & Grev. Ic. Fil. *pl. 176.* 1829.

SPECIMENS EXAMINED: Hawaii, *Robinson 276* V; forest above Cape Lua Pele, *Wilkes Expedition* N; *Wilkes Expedition 19* B, C; Maui, *Robinson 347* V; *Wilkes Expedition* B, C, N; Oahu, *Beechey* C; *Diell* C; *Robinson 87* V; *97* V; Kauai, *Heller 2213* C, N; *Knudsen 154* B; *Robinson 462* V; Hawaiian Islands, *Baldwin 90* B, C, N; *Gaudichaud* B, C; *Hillebrand* B; *Mann & Brigham 276* N.

POLYPODIUM ABIETINUM D. C. Eaton, in Mann, Proc. Am. Acad. 7: 219. 1867

Polypodium tamariscinum var. *abietinum* Hilleb. Fl. Haw. Is. 557. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: On trees, rare; Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; Oahu, *Hillebrand* B; *Remy* C; *Robinson 32* V; *48* V; *Wilkes Expedition* N; Kauai, *Heller 2732* C; N; *Hillebrand* B; *Lichtenthaler* N; Hawaiian Islands, *Baldwin 94* B; C; *Hillebrand* B.

POLYPODIUM HILLEBRANDII Hook. Sp. Fil. 4: 228. 1862

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: At 400–700 m. elevation, rare; Hawaiian Islands.

ILLUSTRATION: Hook. Sp. Fil. 4: *pl. 279A*. 1862.

SPECIMENS EXAMINED: Hawaii, *Robinson 287* V; Oahu, *Forbes* BM; *Robinson 23* V; *123* V; Hawaiian Islands, *Baldwin 92* C, N; *Baldwin 93* C; *Hillebrand* B, C; *Safford 891* N; ex Herb. John Donnell Smith N; *Wilkes Expedition* C.

POLYPODIUM TAMARISCINUM Kaulf. Enum. Fil. 117. 1824

Adenophorus bipinnatus Gaud. Ann. Sci. Nat. 3: 508. 1824.

TYPE LOCALITY: Oahu.

DISTRIBUTION: Hawaiian Islands.

ILLUSTRATION: Hook. & Grev. *pl. 175*. 1829.

SPECIMENS EXAMINED: Hawaii, *Robinson 208* V; *248* V; Oahu, *Copeland* N; *Heller 2214* N; *Lichtenthaler* N; *Mann & Brigham 198* N; *Robinson 83* V; *91* V; *92* V; *118* V; *122* V; *Safford 892* N; Kauai, *Robinson 463* V; *495* V; *832* V; Hawaiian Islands, *Baldwin 91* N; ex Herb. John Donnell Smith N.

POLYPODIUM TRIPINNATIFIDUM (Gaud.) Presl, Tent. Pterid. 178. 1836

Adenophorus tripinnatifida Gaud. Ann. Sci. Nat. 3: 508. 1824; Voy. Freyc. Bot. *pl. 8*. 1826.

Amphoradenium Gaudichaudii Desv. Prod. 336. 1827.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Above 600 m. elevation, Hawaiian Islands.

ILLUSTRATION: Gaud. Voy. Freyc. Bot. *pl. 8.*

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; Maui, *Lichtenthaler* N; Molokai, *Baldwin 93a* B; *93b* B; Kauai, *Remy 16* C; Hawaiian Islands, *Hillebrand 122* B; *Wilkes Expedition 20* B, C.

20. PHYMATODES Presl, Tent. Pterid. 195. 1836

Tropical plants, mostly epiphytic; rootstock creeping; leaves articulate, distant, simple; veins obscure or prominent, anastomosing, with free included veinlets; sorus borne upon anastomosing veins or upon the clavate apex of an included vein, non-indusiate.

Type species: *Polypodium zosteraeforme* Wall.

Leaves linear-lanceolate; veins obscure; sori round, nearly covering leaf from costa to margin, light brown.	*P. elongata.*
Leaves palmately lobed; veins prominent; sori small, dark.	*P. Spectrum.*

PHYMATODES ELONGATA Presl, Tent. Pterid. 196. 1836

Polypodium lineare Thunb. Fl. Jap. 335. 1784. Not Burm.
Pleopeltis nuda Hook. Fil. Exot. 63. 1823.
Pleopeltis linearis Kaulf. Enum. 246. 1824.
Pleopeltis Thunbergiana Kaulf. Wes. d. Farrenkr. 113. 1827.
Polypodium leiopteris Kunze, Klotzsch, Linnaea **23**: 319. 1850.
Drynaria nuda Fée, Gen. **1**: 270. 1850–52.
Drynaria elongata Brack. Fil. U. S. Expl. Exp. 42. 1854.
Niphobolus linearis Keyserl. Polyp. Cyath. Herb. Bung. 39. 1873.

TYPE LOCALITY: Kosido, Japan.

DISTRIBUTION: On trees and rocks; tropical countries.

SPECIMENS EXAMINED: Hawaii, *Lichtenthaler* N; Maui, *Wilkes Expedition* N; *O. Finsch 10* C; Kauai, *Heller 2533* C; *3533* N; Oahu, *Wilkes Expedition* C; *Diell* C; *Heller 2005* C, N; *2076* C, N; *2031* C, N; *Mann & Brigham 177* N; *Robinson 84* V; *Safford 893* N; *1887* N; Hawaiian Islands, *Baldwin 82* C, N; *R. H. Hitchcock* C; ex Herb. John Donnell Smith N.

PHYMATODES SPECTRUM (Kaulf.) Presl, Tent. Pterid. 197. 1836

Polypodium Spectrum Kaulf. Enum. 94. 1824.
Polypodium Thouinianum Gaud. Voy. Freyc. Bot. 348. 1828.

Drynaria spectrum J. Sm. Jour. Bot. Hook. **4**: 61. 1842.
Pleopeltis spectrum Moore, Ind. Fil. 348. 1862.
Colysis Spectra J. Sm. Ferns Brit. & For. 98. 1866.

TYPE LOCALITY: Oahu.

DISTRIBUTION: On rocks and tree trunks in dense shade of woods, Hawaiian Islands, Sumatra.

ILLUSTRATIONS: Gaud. Voy. Freyc. Bot. *pl. 5. f. 1.* E. & P. Nat. Pfl. **1**^{4}: 317. *f. 164A, B.* 1899.

SPECIMENS EXAMINED: Hawaii, *Robinson 200* V; Maui, *Wilkes Expedition* C; Oahu, *Heller 2118* C; *Robinson* V; Kauai, *Heller 2438* C; Hawaiian Islands, *Baldwin 84* C; *Miss Sessions* C; ex Herb. Kew. C.

The leaves of *Phymatodes Spectrum* vary so much in size and cutting of the lobes as to suggest different species for those found growing upon a single rootstock.

21. PHLEBODIUM (R. Br.) J. Sm. Jour. Bot. 4: 58. 1842

Tropical or subtropical plants, usually epiphytic. Rootstock creeping, 1–2 cm. in diameter, paleaceous; leaves articulate; blades pinnatifid or pinnate; primary veins pinnately arranged, the secondary veins anastomosing; sori usually terminal on two included veinlets, non-indusiate.

Type species: *Polypodium aureum* L.

PHLEBODIUM AUREUM (L.) J. Sm. Jour. Bot. Hook. **4**: 58. 1842

TYPE LOCALITY: West Indies.

DISTRIBUTION: On ground and on trees, West Indies, Florida, Mexico, Brazil, Hawaiian Islands.

ILLUSTRATIONS: Plumier, Traitê Foug. *pl. 76.* 1705. PLATE 9.

SPECIMENS EXAMINED: Wahiawa Mts., Kauai, *Forbes 308* BM.

Forbes 308 is the first collection of this species that has been noted for the Hawaiian Islands, and it may be that it is an escape from cultivation, though the remoteness of the locality where it was collected makes its origin from a cultivated plant improbable.

Mr. Forbes notes: "All the fronds were remarkably glaucous blue."

22. POLYSTICHUM Roth, Röm. Mag. 2^1: 106. 1799

Mostly coarse and rigid terrestrial plants of cosmopolitan distribution; rootstock short, erect; leaves cespitose, not articulate; blades pinnate to quadripinnate; veins free; sori roundish, dorsal upon the veins; indusium centrally peltate, orbicular.

Type species: *Polypodium Lonchitis* L.

Leaves tripinnate, ovate-lanceolate, smooth or slightly tomentose. *P. carvifolium.*
Leaves bipinnate; stipe and rachis densely covered with linear-lanceolate scales.
  Pinnae 1.5–3 cm. apart, sharply aristate. *P. haleakalense.*
  Pinnae crowded, margins entire or nearly so. *P. Hillebrandii.*

POLYSTICHUM CARVIFOLIUM (Kunze) C. Chr. Ind. Fil. 70. 1905

Polystichum coniifolium J. Sm. Jour. Bot. Hook. **3**: 413. 1841. Not Presl.

Aspidium curvifolium Kunze, Bot. Zeit. **6**: 283. 1848.

Aspidium aristatum Sw. var. *coniifolium* Wall.; Hook. Sp. Fil. **4**: 27. 1862.

Dryopteris coniifolia Underw. in Heller, Minn. Bot. Stud. **1**: 778. 1897.

TYPE LOCALITY: Philippine Islands.

DISTRIBUTION: High plateaus, China, Japan, Polynesia, Hawaiian Islands, Australia.

SPECIMENS EXAMINED: *Heller 2817* C; *Baldwin 62* C.

The habit, coriaceous texture, and aristate pinnae of this plant place it in *Polystichum* rather than in *Dryopteris*. The indusia are sometimes reniform-orbicular, sometimes peltate, on the same leaf. It is very different from the Japanese *Polystichum aristatum* (Forster) Presl, in rootstock, texture, and the division of the leaf.

POLYSTICHUM HALEAKALENSE Brack. Fil. U. S. Expl. Exp. 204. 1854

Aspidium haleakalense Mann, Proc. Am. Acad. **7**: 216. 1867.

Aspidium aculeatum var. *Braunii* Hilleb. Fl. Haw. Is. 568. 1888. Not Swartz.

TYPE LOCALITY: Region of Sophora, Mauna Kea, Hawaii.

DISTRIBUTION: In forests at altitudes of 1,800–2,700 m., Hawaiian Islands.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 28*. 1854.

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; Maui, *Lichtenthaler* N; *Finsch 45* B; *Lydgate* B; *Lydgate & Baldwin* B; *Mann & Brigham 481* N; *Mann* B; ex Herb. Mt. Holyoke College C; Oahu, *Macrae* B; Hawaiian Islands, *Baldwin 61* C, N; ex Herb. John Donnell Smith N.

POLYSTICHUM HILLEBRANDII Carruth. in Seem. Fl. Vit. 358. 1873

Aspidium Hillebrandi Hilleb. Fl. Haw. Is. 568. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: In forests at altitudes of 1,500–1,800 m., Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Bailey* C; *Baldwin* B, C, V; *Lydgate* B; Hawaiian Islands, *Baldwin 60* B, C.

23. CYRTOMIUM Presl, Tent. Pterid. 86. 1836

Rootstock short; leaves clustered, pinnate, somewhat coriaceous; veins anastomosing; sori globose, dorsal upon free included veinlets or upon connecting veins; indusium peltate.

Type species: *Cyrtomium caryotideum* (Wall.) Presl.

Leaves less than 15 cm. long, with a single row of areolae on either side of the midvein.	*C. Boydiae.*
Leaves more than 15 cm. long, with several areolae between midrib and margin.	*C. caryotideum.*

Cyrtomium Boydiae (D. C. Eaton) comb. nov.

Aspidium Boydiae D. C. Eaton, Bull. Torrey Club **6**: 361. 1879.

Aspidium cyatheoides var. *depauperatum* Hilleb. Fl. Haw. Is. 572. 1888.

Dryopteris cyatheoides C. Chr. Ind. Fil. 66. 1906.

TYPE LOCALITY: Oahu.

DISTRIBUTION: On rocky ledges, along streams, Hawaiian Islands.

ILLUSTRATION: PLATE 10.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; Maui, *Baldwin* C, V; Oahu, *Forbes* BM; *Rock* V.

CYRTOMIUM CARYOTIDEUM (Wall.) Presl, Tent. Pterid. 86. 1836

Aspidium caryotideum Wall. Cat. no. 376. 1828.

Dryopteris caryotidea Underw. in Heller, Minn. Bot. Stud. **1**: 779. 1897.

TYPE LOCALITY: Nepal.

DISTRIBUTION: In forests, India, Polynesia, Hawaiian Islands.

ILLUSTRATIONS: Hook. & Grev. Ic. Fil. *pl. 69.* 1826; Presl, Tent. Pterid. *pl. 2. f. 12.* 1836; Brack. Fil. U. S. Expl. Exp. *pl. 16.* 1854; Hook. Garden Ferns *pl. 13.* 1862.

SPECIMENS EXAMINED: Hawaii, *Lichtenthaler* N; Maui, *Mann & Brigham 487* N; *Wilkes Expedition* N; Kauai, *Heller 2544* C, N; *Hillebrand* B; *Lydgate* B; Lanai, *Hillebrand* B; Oahu, *Forbes 431* BM; Hawaiian Islands, *Baldwin 59* B, C; *Remy* B; *Miss Sessions* C.

Christensen, following Diels (E. & P. Nat. Pfl. 1^4: 194. 1899), makes *Cyrtomium caryotideum* a synonym of *Polystichum falcatum* (L. f.) Diels. However, as *Polystichum* has free veins and this group has anastomosing veins, they are separated on that character rather than combined on the similarity of their indusia. The type of *Polystichum falcatum* is from Japan. Thunberg, Fl. Jap. 336. *pl. 36.* 1784, describes and figures it, but his figure represents a plant with cordate-falcate leaves not auricled, with scales at the base of the leafstalk. The Hawaiian plant resembles Wallich's specimen at Kew, a tracing from which is in the herbarium of the New York Botanical Garden.

24. TECTARIA Cav. Anal. Hist. Nat. 1: 115. 1799

Rootstock creeping or decumbent; leaves clustered, not articulate, various in form, chartaceous; veins reticulate with free included veinlets; leafstalk purplish brown, smooth above, scaly at the base; sori circular; indusium orbicular, attached at the center.

Type species: *Polypodium trifoliatum* L.

Tectaria cicutaria (L.) comb. nov.

Polypodium cicutarium L. Syst. Nat. ed. 10. 2: 1326. 1759.
Aspidium cicutarium Sw. Jour. Bot. Schrad. **1800**^{2}: 36. 1801.
Aspidium apifolium Schkuhr, Krypt. Gew. 1: 198. 1809.
Nephrodium apifolium Hook. & Arn. Bot. Beech. 105. 1832.
Sagenia apiifolia (Schkuhr) J. Sm. Jour. Bot. Hook. 4: 184. 1841.

TYPE LOCALITY: Jamaica, B. W. I. (?).

DISTRIBUTION: In the tropics, on damp rocks, or in depths of shady forests.

ILLUSTRATIONS: Pluk. Almag. 156. *pl. 296. f. 2.* 1692; Schkuhr, Krypt. Gew. *pl. 56b.* 1809; Hook. & Grev. Ic. Fil. *pl. 202.* 1831.

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; Maui, *Bailey* C; *Baldwin* N; *Robinson 314* V; *328* V; *339* V; Oahu, *Beechey* (ex Herb. Mettenius) C; *Mann & Brigham 189* N; *Robin-*

son 13 V; *18* V; *135* V; *Safford 914* N; *915* N; *916* N; *Wilkes Expedition* N; Kauai, *Heller 2842* C, N; *Hillebrand 60* B; *Knudsen 68* B; Hawaiian Islands, *Baldwin 68* B, C, N; *Hillebrand* (ex herb. Berlin) C; *Lindley* C; *Miss Sessions* C; ex Herb. Underw. C; ex Herb. John Donnell Smith N; *Wilkes Expedition* C, N.

25. NEOTTOPTERIS J. Sm. Jour. Bot. Hook. **3**: 409. 1841

A genus of epiphytic ferns, with fleshy, orchid-like roots, found in the forests of tropical Asia, Polynesia, Australia, and Africa. Rootstock erect, short; leaves large, simple, cespitose, sessile or nearly so, spreading, glabrous, entire, arranged spirally with short internodes; veins slender, parallel, close (less than 1 mm. apart), oblique to the midrib, connected by a transverse intramarginal vein at their apices; sori linear, extending from near the midrib ½ to ⅔ the length of the veins in the distal half or two thirds of the leaf.

Type species: *Neottopteris Nidus* (L.) J. Sm.

NEOTTOPTERIS NIDUS (L.) J. Sm.; Hook. & Bauer, Gen. Ferns *pl. 113B.* 1842

Asplenium Nidus L. Sp. Pl. 1079. 1753.
Thamnopteris Nidus Presl, Epim. 68. 1849.

TYPE LOCALITY: Java.

DISTRIBUTION: On trees and on humus soil in forests, usually below 700 m., tropical Asia, Australia, Madagascar, and Polynesia.

ILLUSTRATIONS: Hook. & Bauer, Gen. Ferns *pl. 113B.* 1842; Breyne, Exot. Pl. Cent. *pl. 99.* 1678.

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; Maui, *Bailey* C; Oahu, *Didrichsen 3652* C; *Gaudichaud* B; *Hillebrand* B; *Meyen* B; *Robinson 17* V; *103* V; Kauai, *Heller 205* C; Hawaiian Islands, *Baldwin 30* C; *Mann & Brigham 137* N; *Safford 31* N; *Miss Sessions* C.

26. ASPLENIUM L. Sp. Pl. 1078. 1753

A genus of world-wide distribution, especially well represented in the temperate zones, though including many tropical forms.

Rootstock erect or creeping; leaves non-articulate, usually cespitose; blades simple to quadripinnate, coriaceous to membranaceous; veins free in Hawaiian species; sori linear upon the veins, usually oblique to the midrib or leading vein of the pinna, occasionally parallel with it; indusia attached to veins, opening towards the midrib; sori occasionally athyrioid or diplazioid.

- Leafblades simply pinnate.
  - Pinnae orbicular to rhomboidal or oblong, subentire.
    - Rootstock creeping; leaves distant. *A. unilaterale.*
    - Rootstock short, erect; leaves cespitose.
      - Leafstalk dull green, flexuose.
        - Pinnae rhomboidal to flabellate, occasionally distant, gradually reduced below. *A. rhomboideum.*
        - Pinnae ovate-obtuse, approximate, abruptly reduced below. *A. lunulatum.*
      - Leafstalk dark brown or black, rigid.
        - Blade chartaceous; sori on veins parallel to the lower margin, opening upwards. *A. monanthes.*
        - Blade subcoriaceous; sori on secondary veins, indusium opening toward primary vein.
          - Blade 2.5–10 cm. long; pinnae ovate to suborbicular. *A. Trichomanes.*
          - Blade 15 cm. long; pinnae oblong. *A. pavonicum.*
  - Pinnae lanceolate, margin serrate, incised, or lobed.
    - Leafstalks green.
      - Pinnae auricled at base. *A. pseudofalcatum.*
      - Pinnae not auricled at base.
        - Leafblade coriaceous; basal scales of leafstalk ovate.
          - Pinnae obtuse at apex; broadly ovate; sorus conterminous with vein; veins obscure. *A. Kaulfussii.*
          - Pinnae caudate; sorus shorter than vein; veins distinct. *A. kauaiense.*
        - Leafblade chartaceous; basal scales lanceolate or linear.
          - Leafblade 30–35 cm. long, oblong-ovate; basal scales of leafstalk lanceolate. *A. enatum.*
          - Leafblade 20–25 cm. long, oblong-lanceolate; basal scales of leafstalk linear. *A. Hillebrandii.*
    - Leafstalks brown or steel-blue.
      - Pinnae serrate or incised.
        - Pinnae caudate.
          - Primary veins parallel to the midrib. *A. contiguum.*
          - Primary veins divergent from the midrib. *A. caudatum.*

  - Pinnae acuminate. *A. nitidulum.*
- Pinnae cut into rhombic lobes.
  - Leafstalk and midrib paleaceous. *A. horridum.*
  - Leafstalk and midrib smooth. *A. glabratum.*
- Leafblades more than once pinnate.
  - Blades bipinnatifid to bipinnate, upper basal pinnule auriculate. *A. lobulatum.*
  - Blades bipinnate to quadripinnate, basal pinnules various.
    - Blades bipinnate to tripinnatifid.
      - Blades chartaceous.
        - Blades under 35 cm. long.
          - Blades oblong, ultimate divisions flabellate.
            - Blades 3.75–7 cm. × 12–18 mm. *A. varians.*
            - Blades 20–30 cm. × 18–45 mm. *A. Macraei.*
          - Blades lanceolate, ultimate divisions ovate-lanceolate. *A. Lydgatei.*
        - Blades over 35 cm. long.
          - Pinnae linear-lanceolate, patent; pinnules obliquely trapezoid-ovate. *A. Goldmannii.*
          - Pinnae lanceolate, approximate; pinnules rhomboidal, basal pinnules occasionally auriculate. *A. acuminatum.*
      - Blades coriaceous.
        - Blades oblong, ultimate divisions obovate or truncate.
          - Pinnae obliquely rhomboidal, approximate. *A. rhipidoneuron.*
          - Pinnae ovate oblong, patent.
        - Blades lanceolate. *A. insiticium.*
          - Ultimate divisions flabellate or truncate, pinnae approximate. *A. cuneatum.*
          - Ultimate divisions ovate-lanceolate, patent. *A. parallelum.*
    - Blades tripinnate to quadripinnate.
      - Blades broadly oblong. *A. patens.*
      - Blades deltoid or deltoid lanceolate.
        - Blades broadly deltoid, 10–20 cm. long. *A. Adiantum-nigrum.*
        - Blades deltoid lanceolate, 30 cm. or more long.
          - Blades membranaceous; ultimate divisions spinulose. *A. vexans.*
          - Blades thick, chartaceous.
            - Rachis winged; ultimate divisions spatulate, less than 2 mm. broad. *A. schizophyllum.*
            - Rachis not winged; ultimate divisions 4 mm. or more broad. *A. sphenotomum.*

ASPLENIUM UNILATERALE Lam. Encyc. **2**: 305. 1786

Asplenium resectum J. E. Sm. Pl. Ic. Ined. 3. *pl. 72.* 1790–91.

Asplenium amoenum Presl, Tent. Pterid. 107. 1836.

Asplenium emargino-dentatum Zenker; Kunze, Linnaea **24**: 263. 1851.

TYPE LOCALITY: Mauritius.

DISTRIBUTION: In wet, shady localities, Mauritius, Japan, China, Polynesia, Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Robinson 622* V; *Wilkes Expedition* N; Maui, *Bailey* C; *Lichtenthaler* N; *Heller 2844* C, N; *Robinson 359* V; *366* V; *380* V; Oahu, *Arnott* N; *Beechey* C; *Mann & Brigham 168* N; *Robinson 72* V; *120* V; *122* V; *184* V; *Safford 918* N; Kaala Mts., *Wilkes Expedition* N; Kauai, *Forbes 439* BM; Hawaiian Is., *Baldwin 37* C, N; *Miss Sessions* C; *Wilkes Expedition* C, N; ex Herb. John Donnell Smith N.

ASPLENIUM RHOMBOIDEUM Brack. Fil. U. S. Expl. Exp. 156. 1854

Asplenium stoloniferum Presl, Rel. Haenk. 1:44. 1825. Not Bory.

Asplenium fragile Presl, Hilleb. Fl. Haw. Is. 589. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: At elevations of 400–700 m., Hawaii and Maui.

ILLUSTRATIONS: Brack. Fil. U. S. Expl. Exp. *pl. 21. f. 2.* 1854; Presl, Rel. Haenk. 1: *pl. 6. f. 4.* 1825.

SPECIMENS EXAMINED: Hawaii, Mauna Kea, *Wilkes Expedition* N; Forest near Cape Lua Pele, *Wilkes Expedition* N; Maui, *Hillebrand* N; Hawaiian Is., *Baldwin* B, C, N; ex Herb. John Donnell Smith N.

A. rhomboideum is closely related to the South American *A. fragile* and to *A. viride* of N. Europe and Canada. It differs from both in the openness of the fronds and flabellate form of the pinnae as well as in size.

Kunze (Klotzsch, Linnaea **13**: 140. 1839) in describing *A. fragile* collected by Ehrenberg in Peru gives the length of the largest fronds as 2 in. He describes the habit as the same as that of *A. viride* and makes *A. castaneum* Schlect. (Linnaea **5**: 611. 1830) and *A. projectum* Kunze (Linnaea **9**: 68. 1834) synonyms. Diels, in E. & P. Nat. Pfl. $\mathbf{1}^4$: 235. 1899, gives *A. fragile* as a doubtful species, while he gives *A. castaneum* and *A.*

projectum true specific rank. Christensen (Ind. Fil.) gives the same treatment.

ASPLENIUM LUNULATUM Sw. Jour. Bot. Schrad. **1800**: 202. 1801

Asplenium erectum Bory, Willd. Sp. Pl. **5**: 328. 1810.

TYPE LOCALITY: South Africa.

DISTRIBUTION: Tropical countries.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; *Lichtenthaler* N; Maui, *Bailey* C; *Robinson 720* V; *721* V; Kauai, *Forbes 377* BM; *Heller 2845* C; *Knudsen 147* B; Hawaiian Is., *Baldwin 35* N; *Biddlesome* N.

ASPLENIUM MONANTHES L. Mant. 130. 1767

Asplenium monanthemum Murr. L. Syst. Nat. ed. 13. 785. 1774.
Asplenium Menziesii Hook. & Grev. Ic. Fil. *pl. 100.* 1829.
Asplenium leptophyllum Fée, Mém. Foug. 7. 50. *pl. 14. f. 2.* 1857.

TYPE LOCALITY: Cape of Good Hope.

DISTRIBUTION: At elevations of 900–1,800 m., South America, Northern Africa, the Azores, Madeira Islands, Hawaiian Islands.

ILLUSTRATIONS: J. E. Sm. Pl. Ic. Ined. *pl. 73.* 1790–91; Brack. Fil. U. S. Expl. Exp. *pl. 20. f. 2.* 1854; Fée, Mém. Foug. 7. *pl. 14. f. 2.* 1857; Hook. & Grev. Ic. Fil. *pl. 100.* 1829.

SPECIMENS EXAMINED: Maui, *Bailey* C; *Bishop 77* B; *Hillebrand* B; *Lichtenthaler* N; Kauai, *Knudsen 132* B; Oahu, *Diell* C; Hawaiian Is., *Baldwin 32* B, C; 1838–42; *Wilkes Expedition* N.

In the Berlin Herbarium there are two types of *A. monanthes*, one lax, spreading, with lobed pinnae, proliferous above, the other upright, taller, proliferous from lowest axils of pinnae, yet there is not enough difference to separate them as species.

ASPLENIUM TRICHOMANES L. Sp. Pl. 1080. 1753

Asplenium densum Brack. Fil. U. S. Expl. Exp. 151. 1854.

TYPE LOCALITY: Europe.

DISTRIBUTION: On rocks in temperate regions; on mountain sides in the tropics.

ILLUSTRATIONS: Brack. Fil. U. S. Expl. Exp. *pl. 20. f. 3, 3a.* 1854.

SPECIMENS EXAMINED: Maui, *Bailey* C; *Hillebrand* B; *Finsch 27* B; Oahu, Mt. Kaa, *Macrae* B; Hawaiian Is., *Baldwin* B, C; *Wilkes Expedition* B, C; *Lindley* C.

The difference between *A. densum* Brack. and the European *A. Trichomanes* L. consists in the fewer sori (never more than one row in the Hawaiian plant) and the more prominent wings upon the rachis, which suggests the question whether slight differences between plants widely separated geographically should be regarded as specific.

ASPLENIUM PAVONICUM Brack. Fil. U. S. Expl. Exp. 150. 1854

Asplenium normale Hilleb. Fl. Haw. Is. 588. 1888. Not Don.

TYPE LOCALITY: Saw Mill, Hawaii.

DISTRIBUTION: In moist, shady forests, Hawaiian Islands; rare.

ILLUSTRATION: Brack. U. S. Expl. Exp. *pl. 20. f. 1, 1a, 1b.*

SPECIMENS EXAMINED: Hawaii, *Wilkes 50465* N (type); Kilauea, *Lichtenthaler* N; Maui, *Bailey* C; *Lichtenthaler* N; Kauai, *Forbes 160* BM; *Heller 2771* C, N; *Knudsen 10* B; *Robinson 823* V; Oahu, *Heller 2218* C; *Safford 976* N; *977* N; Hawaiian Is., *Baldwin 33* C; *Lydgate* B; *Macrae* B; *Van Ingen* C; ex Herb. John Donnell Smith N; *Wilkes Expedition* B.

A. pavonicum is very nearly related to *A. normale* Don from Ceylon, but differs in the form of the pinnae and in size.

ASPLENIUM PSEUDO-FALCATUM Hilleb. Fl. Haw. Is. 597. 1888

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; *Robinson 628* V; *620* V; *279* V; *Wilkes Expedition* N; Maui, *Lichtenthaler* C; *Robinson 716* V; *710* V; ex Herb. John Donnell Smith N; Oahu, *Hillebrand* B; *Remy* B; *Robinson 144* V; *173* V; Hawaiian Is., ex Herb. Mt. Holyoke College C.

From the forms of *A. lobulatum* the pinnae of which are little divided, *A. pseudo-falcatum* is distinguished by its chartaceous texture in contrast to the coriaceous texture of *A. lobulatum*.

ASPLENIUM KAULFUSSII Schlect. Adumbr. 29. 1825

Asplenium protensum Kaulf. Enum. 167. 1824. Not Schlect.

Asplenium obtusatum Underw. in Heller, Minn. Bot. Stud. 1: 775. 1897. Not Forst.

TYPE LOCALITY: Oahu.

DISTRIBUTION: Higher forest regions, Oahu, Hawaii.

SPECIMENS EXAMINED: Hawaii, *Remy* B; *Baldwin* B; Oahu, *Anderson* B; *Forbes* BM; *Heller 2361* C; *Day* B; *Macrae* B; Kauai, *Robinson 843* V; Hawaiian Is., *Lydgate* B, C; ex Herb. John Donnell Smith *599* N; *Wilkes Expedition* N.

The sori are usually of the *Asplenium* type but in some cases diplazioid, while in others, the sori borne on adjacent veins face each other.

Asplenium kauaiense (Hilleb.) sp. nov.

Asplenium Mannii var. *kauaiense* Hilleb. Fl. Haw. Is. 595. 1888.

Asplenium obliquum Underw. in Heller, Minn. Bot. Stud. 1: 775. 1897. Not Forst.

TYPE LOCALITY: Kauai.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Kauai, *Knudsen 103* (type) B; *104* B; *105* B; *Heller 2486* C, N; Hawaiian Is., *Wilkes Expedition* N.

ASPLENIUM ENATUM Brack. Fil. U. S. Expl. Exp. 153. 1854

Asplenium lucidum Underw. in Heller, Minn. Bot. Stud. 1: 774. 1897. Not Forst.

TYPE LOCALITY: Kaala Mts., Oahu.

DISTRIBUTION: Hawaiian Islands.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 21. f. 1.* 1854.

SPECIMENS EXAMINED: Oahu, *Wilkes Expedition* N; Maui, *Bailey* C; *Bishop* B; *Lydgate* B, C; *Mann & Brigham 485* N; *Hillebrand* B; Kauai, *Forbes 53* BM; *Heller 2692* C, N; Kauai, *Van Ingen* C; *Robinson 840* V; Oahu, *Day 79* B; *Hillebrand* B; *Lichtenthaler* N; *Safford 871* N; *Wilkes Expedition* C, (type) N; Hawaiian Is., *Baldwin 38* C, N; *Miss Sessions* C; ex Herb. John Donnell Smith *38* N; *39* N; ex Herb. Mt. Holyoke College C.

ASPLENIUM HILLEBRANDII C. Chr. Ind. Fil. 115. 1905

Asplenium Mannii Hilleb. Fl. Haw. Is. 594. 1888. Not Hook.

TYPE LOCALITY: Waianae Range, Oahu.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Oahu, *Hillebrand* B, C; *Safford 917* N; Hawaiian Is., *Miss Sessions* C.

ASPLENIUM CONTIGUUM Kaulf. Enum. 172. 1824

TYPE LOCALITY: Oahu, Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Mann & Brigham 160* N; Maui, *Hillebrand* B; *Robinson 325* V; *382* V; *712* V; *Wilkes Expedition* N; *Lichtenthaler* N; Kauai, *Knudsen 140* B; Oahu, *Bartsch 29* N; *Forbes* BM; *Heller 2115* C, N; *Mann & Brigham 156* N; *Safford 902* N; *903* N; *911* N; *Remy* B; *Wilkes Expedition* N; Molokai, *Hillebrand* B; Hawaiian Is., *Baldwin 40* B, C, N; *42* C; *Lindley* C.

ASPLENIUM CAUDATUM Forst. Prod. 80. 1786

Asplenium spathulinum Hilleb. Fl. Haw. Is. 604. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Tropical countries.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 22.* 1854.

SPECIMENS EXAMINED: Maui, *Hillebrand 13* B; *Robinson 632* V; Kauai, *Forbes 636* BM; *Knudsen 130* B; *137* B; *141* B; *142* B; *148* B; *149* B; Hawaiian Is., *Baldwin* B; *Gaudichaud* B.

Hillebrand, Fl. Haw. Is. 604. 1888, separates *Knudsen 141* and *148* as *A. spathulinum* on the basis that the pinnae in these specimens are more deeply incised than in the others. *Robinson 632* V shows both deeply cut and simply serrate leaves on the same plant.

Many of the segments are somewhat diplazioid, because sori arise on both sides of the initial vein and each extends along one of the forks.

ASPLENIUM NITIDULUM Hilleb. Fl. Haw. Is. 601. 1888

TYPE LOCALITY: Kauapali, W. Maui, Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Hillebrand* B (type); *Bailey* C; *Lichtenthaler* N; Oahu, *Heller 2055* C; Hawaiian Is., *Baldwin* N.

This is separated from *A. contiguum* on its firmer character and the acuminate apices of its pinnae in contrast to the lax and often recurving pinnae of the latter.

Heller 2055, though soriferous and apparently typical as to size and form of pinnae, has laciniate leaf blades on each plant that present the same ragged appearance that Hillebrand describes for *A. contiguum* var. *laciniatum.* Some of the specimens are diplazioid.

ASPLENIUM HORRIDUM Kaulf. Enum. 173. 1824

TYPE LOCALITY: Oahu.

DISTRIBUTION: In valleys above 500 m. elevation; South Pacific Islands and Hawaiian Islands.

ILLUSTRATION: Hook. Sp. Fil. 3: *pl. 193.*

SPECIMENS EXAMINED: Hawaii, *Remy* B; *Robinson 204* V; Maui, *Bishop 55* B; Oahu, *Anderson* B; *Forbes* BM; *Hillebrand* B; *Lichtenthaler* N; *Mann & Brigham 58* N; *Hillebrand* B; *Safford 908* N; *Wilkes Expedition* N; Kauai, *Heller 2853* C, N; *Knudsen 116* B; Hawaiian Is., *Baldwin 45* B, C, N; *Gaudichaud* B; *Wilkes Expedition* C, N; *Miss Sessions* C.

Asplenium glabratum sp. nov.

Rootstock short, scaly; leaves cespitose; leafstalk 25–50 cm. long, dull green to steel-blue, naked; blade 35–70 cm. × 11–20 cm., oblong, lanceolate, coriaceous, dull green; pinnae 5–10 cm. × 11–12 mm., oblong-lanceolate, cut into obliquely obovate, sometimes recurving lobes; veins flabellate; sori on the anterior vein in each lobe parallel to the midrib and also on other veins.

Asplenium horridum var. B. Hilleb. Fl. Haw. Is. 604. 1888.

Asplenium horridum Kaulf. var. Underw. in Heller, Minn. Bot. Stud. **1**: 774. 1897.

TYPE LOCALITY: Woods of Kahuku and Kahana, Oahu.

DISTRIBUTION: Oahu and Kauai, Hawaiian Islands.

SPECIMENS EXAMINED: Kauai, *Heller 2588* C (type), N; Hawaii, *Robinson 295* V; Oahu, *Hillebrand* B.

This species is distinguished from *A. horridum* Kaulf. by the smoothness and dull steel-blue color of its leafstalk and midrib, and by the greater number of sori which extend along the flabellate veins of the pinnae.

ASPLENIUM LOBULATUM Mett. in Kuhn, Linnaea **36**: 100. 1869

TYPE LOCALITY: Oahu, Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Mann & Brigham 167* N; *Robinson 612* V; *707* V; *Wilkes Expedition* N; Maui, *Bailey* C; *Robinson 348* V; *371* V; Oahu, *Heller 2115* C, N; *Mann & Brigham 517* N; Oahu, *Robinson 138* V; *146* V; Kauai, *Van Ingen* C; *Miss Sessions* C.

The following specimens are diplazioid in certain pinnules: *Bailey* C; *Van Ingen* C; *Meyen* B; *Miss Sessions* C; *Wilkes Expedition* N.

ASPLENIUM VARIANS Hook. & Grev. Ic. Fil. *pl. 172*. 1830

TYPE LOCALITY: Nepal.

DISTRIBUTION: Japan, China, Ceylon, Africa, Hawaiian Islands.

ILLUSTRATION: Hook. & Grev. Ic. Fil. *pl. 172*. 1829.

SPECIMENS EXAMINED: Maui, *Lichtenthaler* N; *Baldwin 53* B, C, N; ex Herb. John Donnell Smith N.

Hooker and Greville state that this is not mentioned in Wallich's list of the plants in the herbarium of the East India Company, though he collected it at Nepal in 1818 and presented the type specimen to Dr. Hooker at Kew (Ms. Herb. Hook.).

ASPLENIUM MACRAEI Hook. & Grev. Ic. Fil. *pl. 217*. 1831

Asplenium strictum Brack. Fil. U. S. Expl. Exp. 168. 1854.
Asplenium erectum Macraei Hilleb. Fl. Haw. Is. 590. 1888.
Asplenium rhizophyllum Heller, Minn. Bot. Stud. 1: 775. 1897. Not Kunze.
Asplenium lunulatum var. C. Chr. Ind. Fil. 119. 1906.

TYPE LOCALITY: Oahu.

DISTRIBUTION: On ground in open woods, Hawaiian Islands.

ILLUSTRATION: Hook. & Grev. Ic. Fil. *pl. 217*. 1831.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; *Safford 99* N; Oahu, *Heller 2117* C, N; *Hillebrand* B; *Mann & Brigham 173* N; *Macrae* B; *Robinson 136* V; *139* V; *164* V; *Safford 897* N; *Wilkes Expedition* N; Kauai, *Forbes 390* BM; *2764* C, N; *Knudsen 110* B; *133* B; *145* B; *146* B; *148* B; *Lichtenthaler* N; *Wilkes Expedition* N; Hawaiian Islands, *Baldwin 36* C; *Miss Sessions* C; ex Herb. John Donnell Smith N; *Wilkes Expedition* C, N.

Hillebrand's *Asplenium erectum e myriophyllum* doubtless belongs here. *Heller 2764*, *Knudsen 145*, *Baldwin 36*, and *Gaudichaud* (B) conform to the *e* type, which has slender, spaced pinnules, while *Heller 2117* and *Heller 2764* have both open and the compact forms of leaf upon the same plant. Occasionally a sorus is diplazioid.

Hillebrand describes *A. erectum* as having a smooth rachis, while *A. Macraei* has a winged rachis.

The original description of *A. lunulatum* (Sw. Jour. Bot. Schrad. **1800**^{2}: 52. 1801) gives the pinnae as rhomboid, ovate, crenulate; the African specimens are simply pinnate, the pinnae being auricled.

ASPLENIUM LYDGATEI Hilleb. Fl. Haw. Is. 596. 1888

TYPE LOCALITY: Niu, Oahu.

DISTRIBUTION: Known from type locality only.

The plant is represented at Berlin by two specimens collected by Lydgate in 1871.

Asplenium Goldmannii Underw. in herb., nom. nov.

Tarachia polyphylla Presl, Epim. 83. 1849.

Asplenium polyphyllum Hilleb. Fl. Haw. Is. 607. 1888. Not Bert.

TYPE LOCALITY: Oahu, Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

ILLUSTRATION: Mett. Aspl. *pl. 5. f. 23.* 1859.

SPECIMENS EXAMINED: Oahu, *Baldwin 51a* B, C; *Forbes* BM; *Wilkes Expedition* N; *Lydgate* B; Hawaiian Islands (collector unknown) C.

ASPLENIUM ACUMINATUM Hook. & Arn. Bot. Beech. 106. 1832

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Bailey* C; *Baldwin 51b* B; *51c* B; *Hillebrand* C; *Robinson 376* V; Oahu, *Forbes* BM; *Hillebrand* B; *Robinson 149* V; *151* V; *186* V; *Wilkes Expedition* N; *Lichtenthaler* N; Kauai, *Forbes 85* BM; *140* BM; *Robinson 428* V; *479* V; *488* V; *497* V; *702* V; Hawaiian Islands, *Baldwin 51* C, N, C; *Mann & Brigham 494* N; *Wilkes Expedition* N; ex Herb. John Donnell Smith N.

Asplenium rhipidoneuron nom. nov.

Asplenium furcatum Hilleb. Fl. Haw. Is. 604. 1888. Not Thunb.

TYPE LOCALITY: Haleakala, Maui.

DISTRIBUTION: Hawaiian Islands.

ILLUSTRATION: Hook. & Grev. Ic. Fil. *pl. 189.* 1831.

SPECIMENS EXAMINED: Hawaii, *Baldwin 50* B, C, N; *Wilkes Expedition* N; Maui, *Bailey* C; *Baldwin 44* (type) B, C, N; *Robinson 353* V; *392* V; *796* V; *Wilkes Expedition* N; Oahu, *Mann & Brigham 261* N; *Wilkes Expedition* N; Kauai, *Forbes 58* BM; *Heller 2872* C, N; *Van Ingen* C; Hawaiian Islands, *Baldwin 49* C; *Wilkes Expedition* C.

A. rhipidoneuron may be separated into two forms.

Pinnae under 4 cm. long, rhombic.
Pinnae 6–15 cm. long, acuminate.

This will scarcely separate them as two species, but it is interesting as it suggests the possible crossing of *A. lobulatum* and *A. cuneatum.*

ASPLENIUM INSITICIUM Brack. Fil. U. S. Expl. Exp. 161. 1854

Asplenium cristatum Brack. Fil. U. S. Expl. Exp. 163. 1854. Not Lam.

TYPE LOCALITY: Hawaiian Is., in forests.

DISTRIBUTION: Hawaiian Is., Philippine Is., New Caledonia.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 22. f. 2.* 1854.

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition* N; *Mann & Brigham* N; Maui, *Bailey* C; *Hillebrand* B; *Lichtenthaler* N; Waiopua, *Lichtenthaler* N; Oahu, *Baldwin* B; *Forbes* BM; *Heller 2310* C, N; *Hillebrand* B; Nuuanu, *Robinson 142* V; *Hillebrand* B; Hawaiian Is., *Baldwin 41* C; *43* C, N; *Wilkes Expedition* N; ex Herb. John Donnell Smith N.

A. insiticium Brack. is a more delicate fern than *A. lobulatum.*

The following specimens are diplazioid: *Asplenium insiticium grandipinnatum* Hillebrand B; *Asplenium insiticium pseudonitidum* Hillebrand B.

ASPLENIUM CUNEATUM Lam. Encyc. 2: 309. 1786

TYPE LOCALITY: Jamaica, B. W. I.

DISTRIBUTION: West Indies, Philippine, Fiji, Samoan, and Hawaiian Islands.

ILLUSTRATIONS: Sloane, Hist. Jam. 1: 46. *f. 2.* 1707. Brack. Fil. U. S. Expl. Exp. *pl. 21.* 1854.

SPECIMENS EXAMINED: Maui, *Robinson 344* V; *702* V; Kauai, *Heller 2865* C, N; ex Herb. John Donnell Smith N.

This differs from *A. insiticium* in texture and color and is smaller than the average specimen of the latter, though their dimensions overlap.

ASPLENIUM PARALLELUM Baker, Hook. & Baker, Syn. Fil. 486. 1874

Asplenium bipinnatum Hilleb. Fl. Haw. Is. 595. 1888.

TYPE LOCALITY: Niu, Oahu.

DISTRIBUTION: Known from type locality only.

SPECIMENS EXAMINED: Hillebrand B.

This plant is represented by one sheet labelled *Asplenium flaccidum* which is placed with *Asplenium Lydgatei*, at Berlin. It differs from *A. Lydgatei* in being more sturdy in habit and firmer in texture.

ASPLENIUM PATENS Kaulf. Enum. 175. 1824. Not Hook. & Arn. Not Gaud.

TYPE LOCALITY: Oahu.

DISTRIBUTION: Hawaiian Islands.

ILLUSTRATION: Hook. Sp. Fil. 3. *pl. 203.* 1860.

SPECIMENS EXAMINED: Oahu, *Hillebrand* B; Maui, *Hillebrand* B, K; *Lydgate B.*

This rare species resembles *A. cuneatum* in habit in spite of its larger size and tripinnate divisions.

ASPLENIUM ADIANTUM-NIGRUM L. Sp. Pl. 1081. 1753

A. patens Gaud. Voy. Freyc. Bot. 320. 1828. Not Kaulf.

TYPE LOCALITY: Southern Europe.

DISTRIBUTION: Tropical countries.

SPECIMENS EXAMINED: Hawaii, *Lichtenthaler* N; *Mann &*

Brigham 259 N; District of Waimea, *Wilkes Expedition* N; Mauna Kea, *Wilkes Expedition* N; Mauna Loa, *Wilkes Expedition* N; Maui, *Hillebrand* B; Haleakala, *Hillebrand* B; *Finsch 8* B; *Wilkes Expedition* N; *Bailey* C; Kauai, *Knudsen* B; *Wilkes Expedition* N; Hawaiian Islands, *Baldwin 48* B, C, N, V; *Gaudichaud* B; *Wilkes Expedition* B, C; *Douglas* B; *Hillebrand* B; ex Herb. John Donnell Smith N.

Gaudichaud's specimen in the Berlin Herbarium is labelled "Forma acutum Bory, var. Onopteris L.," but the plant is not distinguishable by dentation or by other characteristics from other specimens of *A. Adiantum-nigrum*.

ASPLENIUM VEXANS Heller, Minn. Bot. Stud. **1**: 776. 1897

TYPE LOCALITY: Slopes of Konahuanui, above Manoa, Oahu.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Oahu, *Heller 2058* (type) C; *Robinson* V; *Baldwin* V.

ASPLENIUM SCHIZOPHYLLUM C. Ch. Ind. Fil. 131. 1905. Not Sw.

A. dissectum Brack. Fil. U. S. Expl. Exp. 170. 1854. Not Sw.

TYPE LOCALITY: Hawaii.

DISTRIBUTION: On ground and on trees, Hawaiian Islands.

ILLUSTRATION: Brack. Fil. U. S. Expl. Exp. *pl. 24*. 1854.

SPECIMENS EXAMINED: Hawaii, *Baldwin 51d* B, C; *Hillebrand* B, C; *Lydgate* B; Maui, *Hillebrand* B; Oahu, *Wilkes Expedition* N; Kauai, *Forbes 361* BM; *Heller 2765* C, N; *Knudsen 113, 115* B; *Johnson* B; Hawaiian Islands, *Baldwin 49* N; *Wilkes Expedition* N.

ASPLENIUM SPHENOTOMUM Hilleb. Fl. Haw. Is. 599. 1888

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: In forests at 1,300–1,600 m. elevation, Hawaiian Islands.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; Maui, *Baldwin 52* B; Kauai, *Forbes 339* BM; *420* BM; *Knudsen 108* B; *117* B; Hawaiian Islands, *Baldwin 52* N.

Species inquirendae

Asplenium pellucidum Lam. Encyc. **2**: 305. 1786

Type locality unknown.

Distribution: Malaysia-Polynesia.

Specimens examined: Ex Herb. Kunth; *Meyen* B.

One specimen with auricled pinnae 52-jugate, and corresponding in other respects to *A. pellucidum* Lam. is in the Berlin Herbarium and was originally in Kunth's Herbarium given by Dr. Meyen in 1833. The specimen is no doubt correctly named but correctness of the locality seems doubtful.

Asplenium meiotomum Hilleb. Fl. Haw. Is. 596. 1888

Type locality: Wailupe, Oahu.

Distribution: Known from type locality only.

Specimens examined: *Hillebrand* B.

This is represented by a single sterile specimen at Berlin, but Hillebrand's description proves that this is not his entire collection of the plant. It may be a teratological form.

Asplenium Knudsenii Hilleb. Fl. Haw. Is. 601. 1888

No specimen so labelled or corresponding to Hillebrand's description was found in the Berlin Herbarium.

27. ATHYRIUM Roth, Mag. Bot. Roem. & Ust. 2^1: 105. 1799

Rootstock short, suberect; leafstalks non-articulate, basal scales usually thin-walled; blades thin, herbaceous, 1–3-pinnate; veins free; vascular bundles of leafstalk in two strands at base, uniting above; sori linear or curving across the vein, or roundish at the end of a vein; indusia corresponding with the sorus in shape, or rarely absent.

Leafblades bipinnatifid.
    Sori on distal portion of veins but not protruding beyond margin of lobe. *A. deparioides.*
    Sori protruding beyond the margin of the lobe, in some cases apparently stipitate. *A. proliferum.*
Leafblades tripinnate to quadripinnate.
    Sori medial upon veins; ultimate divisions of pinnule oblong. *A. Poiretianum.*
    Sori along distal portions of veins; ultimate divisions of pinnule linear. *A. Baldwinii.*

ATHYRIUM DEPARIOIDES (Brack.) Christ, p. p. Farnkr. Erde 223. 1897

[Excl. description and figures]

Asplenium deparioides Brack. Fil. U. S. Expl. Exp. 172. 1854
Athyrium proliferum C. Chr. p. p. Ind. Fil. 145. 1905.

TYPE LOCALITY: Kaala Mts., Oahu.

DISTRIBUTION: Hawaiian Islands.

SPECIMENS EXAMINED: Oahu, *Baldwin* B; *Baldwin 77* B; *Forbes* BM; *Hillebrand* B; *Lydgate* B; Kauai, *Forbes 32* BM; *Forbes 215* BM; *Forbes 238* BM; *Heller 2303* C; *Heller 2690* C; *Baldwin 47b* C; Hawaiian Is., *Baldwin 47* C.

ATHYRIUM PROLIFERUM (Kaulf.) C. Chr. p. p. 145. 1905

Dicksonia prolifera Kaulf. Enum. 225. 1824.
Deparia Macraei Hook. & Grev. Ic. Fil. *pl. 154*. 1829.
Cibotium proliferum Presl, Tent. Pterid. 69. 1836.
Asplenium deparioides var. *y*, Hilleb. Fl. Haw. Is. 615. 1888.
Athyrium deparioides Christ, p. p. Farnk. Erde 223. 1897.
Deparia triangularis Underw. in Heller, Minn. Bot. Stud. 1: 778. 1897.

TYPE LOCALITY: Oahu.

DISTRIBUTION: In wet woods, 300–600 m. elevation, Hawaiian Islands.

ILLUSTRATIONS: Hook. & Grev. Ic. Fil. *pl. 154*. 1829; Christ; Farnk. Erde 223. 1897.

SPECIMENS EXAMINED: Oahu, *Baldwin* B; *Beechey* C; *Brackenridge* N; *Forbes* BM; *Lichtenthaler* N; Kauai, *Heller 2740* C, *Heller 2057* C.

ATHYRIUM POIRETIANUM (Gaud.) Presl, Tent. Pterid. 98. 1836

Asplenium Poiretianum Gaud. Voy. Freyc. Bot. 321. *pl. 13*. 1832.
Allantodia scandicinum Kaulf. Enum. 179. 1836.
Asplenium scandicinum Underw. in Heller, Minn. Bot. Stud. 1: 775. 1897. Not Presl.

TYPE LOCALITY: Oahu.

DISTRIBUTION: In wet forests, at altitudes of 200–300 m., Hawaiian Islands.

ILLUSTRATION: Gaud. Voy. Freyc. Bot. *pl. 13*. 1832.

SPECIMENS EXAMINED: Hawaii, Robinson *616* V; *625* V; Maui, *Bailey* C; *Finsch* B; *Hillebrand* B; *Robinson 715* V; Oahu, *Chamisso* B; *Diell* C; *Forbes* BM; *Hillebrand 27* B; *Macrae* B; *Meyen* B; Kauai, *Heller 2623* C; *Hillebrand 118a* B; Hawaiian Is., *Baldwin 53* B, C; *Gaudichaud* (type) B; *Miss Sessions* C; *Wilkes Expedition* C.

ATHYRIUM BALDWINII (Hilleb.) C. Chr. Ind. Fil. 140. 1905

Asplenium Baldwinii Hilleb. Fl. Haw. Is. 618. 1888.

TYPE LOCALITY: Kauai.

DISTRIBUTION: High altitudes, Kauai.

SPECIMENS EXAMINED: Kauai, *Bailey* C; *Baldwin 54* (type) B, C, K; *Forbes 125* BM; *240* BM; *Robinson 402* V; *426* V; *458* V; *461* V; *464* V.

The sori are subapical in this species and a fibrillose scale appears at the base of almost every pinna, while the sori of *A. Poiretianum* are typically medial or proximal upon the veins.

28. DIPLAZIUM Sw. Jour. Bot. Schrad. **1800**^{2}: 61. 1801

Rootstock short, creeping or suberect; leafblades simple to quadripinnatifid; basal scales of leafstalk clathrate, with or without glands; vascular bundles two at the base of leafstalk uniting above; veins free, once to several times forked; sori linear, indusiate, often double, the indusium opening as in *Asplenium.*

Type species: *Diplazium plantaginifolium* (L.) Sw.

The Hawaiian species of *Diplazium* form a very natural group, more firm in texture and coarser in habit than the species of *Athyrium*, hence it seems better on account of the limitations of this paper to follow Diels (Eng. & Prantl, Nat. Pflanzenfam. **1**^{4}: 224. 1902) than to place these plants in the genus *Athyrium*, following Milde (Bot. Zeit. **24**: 373. 1866) and Copeland (Philipp. Jour. Sci. 3: (Bot.) 285. 1908).

Leaves pinnate; rootstock erect or creeping; leafstalks more or less paleaceous at base, with non-glandular scales.
  Rootstock erect; leafstalks stout, dull green, dark brown in drying; basal scales few, light brown; leafblade ovate-lanceolate, 15–30 cm. long, membranous; middle pinnae linear-lanceolate, 12.5–15 cm. × 7–22 mm.; basal pinnae reduced, the lowest auricled. *D. marginale.*
  Rootstock creeping; leafstalks slender, stramineous; basal scales dark brown.

Basal scales of leafstalks persistent, numerous; leafblade 45–75 cm. long; middle pinnae linear-lanceolate, falcate; basal pinnae reduced. *D. Fenzlianum.*

Basal scales of leafstalk few, caducous; leafblade 15–30 cm. long; middle pinnae oblong-lanceolate, truncate at the base and parallel to the rachis above, oblique below; basal pinnae not reduced. *D. molokaiense.*

Leaves bipinnate to tripinnate; rootstock creeping; leafstalks paleaceous with glandular scales at base when young, glabrate with age.

Leafblade deltoid or ovate-deltoid, light green, deeply tripinnatifid; pinnae oblong-lanceolate; lower pinnae 5–7.5 cm. distant; pinnules lanceolate. *D. Arnottii.*

Leafblade ovate-oblong, dark green, tripinnate; lower pinnae 12.5–15 cm. distant; pinnules oblong-lanceolate. *D. sandwichianum.*

DIPLAZIUM MARGINALE (Hilleb.) C. Chr. Ind. Fil. 235. 1905

Asplenium marginale Hilleb. Fl. Haw. Is. 613. 1888.

TYPE LOCALITY: Molokai.

DISTRIBUTION: Lower forests, Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Lydgate* B; Molokai, *Hillebrand* (type) B; Oahu, *Baldwin 47a* B; *47b* B; Kauai, *Knudsen 151* B.

DIPLAZIUM FENZLIANUM (Luers.) C. Chr. Ind. Fil. 232. 1905

Asplenium Fenzlianum Luerssen in Wawra, Flora **58**: 434. 1875.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: In isolated localities, Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Bailey* C; Oahu, *Baldwin* B; *Hillebrand* B; *Lydgate* B; Molokai, *Hillebrand* B; Hawaiian Is., *Hillebrand* B.

Diplazium molokaiense nom. nov.

Asplenium arboreum Hilleb. Fl. Haw. Is. 609. 1888. Not Willd.

TYPE LOCALITY: Molokai, Hawaiian Islands.

DISTRIBUTION: In wet gulches, Hawaiian Islands.

SPECIMENS EXAMINED: Molokai, *Baldwin 46* B; *Hillebrand* (type) B; Oahu, *Baldwin* B; Kauai, *Forbes 438* BM; *Knudsen 102* B.

DIPLAZIUM ARNOTTII Brack. Fil. U. S. Expl. Exp. 144. 1854

Asplenium diplazioides Hook. & Arn. Bot. Beech. 107. 1832. Not Bory.

Asplenium Arnottii Baker in Hook. & Baker, Syn. Fil. 240. 1867.

Athyrium Arnottii Milde, Bot. Zeit. **28**: 371. 1870.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Lower forests, Hawaiian Islands.

SPECIMENS EXAMINED: Maui, *Bailey* C; Molokai, *Hillebrand* B; Oahu, *Beechey* C; *Beratz* B; *Forbes* BM; *Heller 2900* C; *Hillebrand* B; Kauai, *Johnson* B; Hawaiian Is., *Baldwin 55* C; *56* B, C; *57* C; *Mrs. Gulick* C; ex Herb. Kewensis C.

Though the rootstock is prostrate, this fern has almost the appearance of an arborescent form, the leaves reaching a height of from five to six feet.

The Hawaiians prize the tips of the young fronds as a salad.

DIPLAZIUM SANDWICHIANUM (Presl) Diels, in E. & P. Nat. Pflanzenfam. 1⁴: 228. 1899

Athyrium sandwichianum Presl, Tent. Pterid. 98. 1836.

Asplenium sandwichianum Hook. Sp. Fil. **3**: 225. 1860.

Asplenium brevisorum Baker, in Hook. & Baker, Syn. Fil. Ed. 2. 228. 1874.

TYPE LOCALITY: Oahu, Hawaiian Islands.

DISTRIBUTION: Hawaiian Islands, Peru.

SPECIMENS EXAMINED: Hawaii, *Beratz* B; *Robinson 620* V; Maui, *Hillebrand* B; *Robinson 386* V; Molokai, *Hillebrand* B; Oahu, *Diell* C; *Forbes* BM; *Heller 2073* C; *Macrae* C; *Meyen* B (cotype); *Robinson 148* V; *156* V; *160* V; Hawaiian Is., *Baldwin* B; ex Herb. Mt. Holyoke College C; *Wilkes Expedition* C.

SPECIES INQUIRENDA

DIPLAZIUM SANDWICHENSE Presl, Epim. 85. 1850–52

From Presl's description this seems to be a form very closely related to *Diplazium molokaiense*, differing from it in the deeper cutting of the lobes and the greater length of the auricle.

Meyen's type is doubtless still in Presl's Herbarium in the Bohemian University at Prague. There seems to have been no further collection of the plant.

29. SADLERIA Kaulf. Enum. 162. 1824

Sadleria, an endemic Hawaiian genus, is frequently found as a pioneer on disintegrating lava rock. It differs conspicuously in its greater size, rigidity, and the number of its scales, from *Blechnum*, with which Brackenridge and Gaudichaud united it on the basis of the similarity of its sori.

Caudex erect, often arborescent, more or less clothed with scales, or "pulu"; leaves bipinnatifid to bipinnate, 60–180 cm. long in arborescent species, 25–50 cm. in herbaceous forms, usually coriaceous; sori linear upon the intercostal arches on either side of, and parallel to, the midrib of the pinnule, covered by a coriaceous indusium; sporangia short-stalked.

Type species: *Sadleria cyatheoides* Kaulf.

- Caudex arborescent, 60–300 cm. in height.
  - Leafstalk scaly at base, naked or slightly furfuraceous above; sori usually extending nearly the length of the segment.
    - Leafstalk 60–90 cm. long, sulcate, densely clothed at base with light brown scales, 3–4 cm. × 5 mm., slightly chaffy above; blades chartaceous to subcoriaceous, furfuraceous when young, nearly glabrate when mature, oblong-lanceolate, 150–200 cm. long, bipinnate; pinnae linear, 30–60 cm. × 4–7.5 cm.; pinnules 3 mm. apart. *S. Souleytiana.*
    - Leafstalk 30–60 cm. long, not sulcate, paleaceous at the base with scales 4–5 cm. × 3 mm., naked above; blades coriaceous, glabrate, ovate-oblong, 60–90 cm. long, bipinnatifid; pinnae linear-lanceolate, 15–20 cm. × 1.5–2 cm.; segments of pinnae 2 mm. apart. *S. cyatheoides.*
  - Leafstalk scaly throughout, 20–45 cm. long, sulcate; basal scales ribbed, and revolute, upper scales ribless, chaffy; blades coriaceous, oblong, acuminate, 45–60 cm. long, bipinnatifid; pinnae oblong, falcate, 10–16 cm. × 15 mm., chaffy along the midrib; sori usually not as long as the segment, often less than half as long. *S. Hillebrandii.*
- Caudex not arborescent, 2–15 cm. in height; leafstalk densely paleaceous as are midribs and costae.
  - Leafstalk 15–25 cm. long; scales dark brown, 10–15 cm. long; blades coriaceous, oblong-lanceolate, 25–50 cm. long, pinnae 5–10 cm. × 12–25 mm.; pinnules crowded; margins crenulate. *S. polystichoides.*
  - Leafstalk 12–15 cm. long; scales reddish brown, 6–10 cm. long; blades subcoriaceous, ovate-lanceolate, 28–30 cm. long; pinnae 2–4 cm. × 0.75–1 cm., reduced below, not crowded; margins entire. *S. unisora.*

SADLERIA SOULEYTIANA (Gaud.) Moore, Ind. Fil. 26. 1857

Blechnum Souleytianum Gaud. Voy. Bonite Bot. *pl. 2. f. 7, 8; pl. 134.* 1846–49.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Common in deep wet woods at high elevations Hawaiian Islands.

ILLUSTRATIONS: Gaud. Voy. Bonite Bot. *pl. 2. f. 7, 8. pl. 134.* 1846–49.

SPECIMENS EXAMINED: Maui, *Bailey* C; Kauai, *Heller 2807* C; N; Oahu, *Forbes* BM; *Hillebrand* B; Lanai, *Hillebrand* B; Hawaiian Islands, *Baldwin 24* C; N.

SADLERIA CYATHEOIDES Kaulf. Enum. 162. 1824

Blechnum Fontanesianum Gaud. Voy. Freyc. Bot. 397. *pl. 15.*
Sadleria pallida Hook. & Arn. Bot. Beech. 75. 1832.
Blechnum pallidum Brack. Fil. U. S. Expl. Exp. 133, in part, 1854.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: Lower elevations, Hawaiian Islands and Sumatra.

ILLUSTRATION: Gaud. Voy. Freyc. Bot. *pl. 15.*

SPECIMENS EXAMINED: Hawaii, *Wilkes Expedition 12* C, N; *13* C, N; Maui, *Bailey* C; Oahu, *Chamisso* B; *Freycinet* K; *Gaudichaud* B; *Hillebrand* B; *Lichtenthaler* N; *Macrae* C; *Mann & Brigham 188* N; *Safford 866* N; *867* N; *868* N; ex Herb. Copeland N; Kauai, *Forbes 40* BM; Hawaiian Islands, *Baldwin 23* B, N; *Miss Sessions* C; ex Herb. John Donnell Smith N.

Chamisso's type in the Berlin herbarium consists of two sheets: (1) Leafstalk 15 cm. long with rigid scales at base, blade 18-jugate, 23 cm. wide; (2) fragment without apex, 16-jugate; slightly wider.

Sadleria Hillebrandii nom. nov.

Sadleria pallida Hilleb. Fl. Haw. Is. 582. 1888. Not Hook. & Arn. Bot. Beech. 75. 1832.
Blechnum pallidum Brack. Fil. U. S. Expl. Exp. 133, in part. 1854.

TYPE LOCALITY: Kauai, *Hillebrand 80* (Herb. Kgl. Bot. Gart. Berlin).

DISTRIBUTION: In dry, exposed places, Hawaiian Islands.

ILLUSTRATION: PLATE 11.

SPECIMENS EXAMINED: Hawaii, *Hillebrand* B; Maui, *Bailey* C; Oahu, *Hillebrand 83* B; *Robinson 14* V; *19* V; Kauai, *Hillebrand 80* (type) B; *Heller 2866* C, N.

Sadleria pallida Hook. & Arn. proves to be a synonym of

Sadleria cyatheoides Kaulf. The plants confused under this name by Brackenridge, Hillebrand, and most later writers form a distinct species, here named for Hillebrand, since he has most fully described it.

This species is one of the first to gain a foothold upon the lava in the floors of the old craters and is very resistant to dry winds on exposed bluffs.

SADLERIA POLYSTICHOIDES (Brack.) Heller, Minn. Bot. Stud. 1: 788. 1897

Blechnum squarrosum Gaud. Voy. Bonite Bot. *pl. 2. f. 1, 6.* 1846–49. Without description.

Blechnum polystichoides Brack. Fil. U. S. Expl. Exp. 134. 1854.

Sadleria squarrosa Hilleb. Fl. Haw. Is. 582. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: In forests on lower slopes of mountains, Hawaiian Islands.

ILLUSTRATIONS: Gaud. Voy. Bonite Bot. *pl. 2. f. 1, 6.* 1846–49.

SPECIMENS EXAMINED: Hawaii, *Lichtenthaler* N; *Wilkes Expedition* N; Oahu, *Forbes* BM; *Hillebrand* B; *Lydgate* B; *Heller 2392* C, N; Molokai, *Hillebrand* B; Kauai, *Forbes 216* BM; Hawaiian Islands, *Gaudichaud* B; *Baldwin 25* B, C, N.

Sadleria unisora (Baker) comb. nov.

Polypodium unisorum Baker; Hook. & Bak. Syn. Fil. 307. 1867.

Gymnogramme sadlerioides Underw. in Heller, Minn. Bot. Stud. 1: 781. 1897.

Sadleria squarrosa var. *depauperata* Hilleb. Fl. Haw. Is. 583. 1888.

TYPE LOCALITY: Hawaiian Islands.

DISTRIBUTION: On rocky walls of high plateaus, Hawaiian Islands.

ILLUSTRATIONS: Underw. in Heller, Minn. Bot. Stud. 1: *pl. 43.* 1897. PLATE 12.

SPECIMENS EXAMINED: Kauai, *Hillebrand* B; *Forbes 445* BM; *Heller 2863* C; N.

This is undoubtedly a valid species, rather than an ecological "variety" of *S. polystichoides*, as it has been termed by Hillebrand (Hilleb. Fl. Haw. Is. 583. 1888), for true *S. polystichoides* grows in the neighborhood of Kilauea, under conditions apparently as xerophytic as those under which *S. unisora* is found.

30. DOODIA R. Br. Prod. Fl. N. Holl. 151. 1810

Rootstock short, oblique; leaves clustered, pinnatifid to pinnate, coriaceous; leafstalk scaly; veins connected by one or more arches parallel to the midrib; sori oblong or slightly curved, in one or more rows parallel to the midrib; indusium membranaceous, opening toward the midrib.

Type species: *Doodia aspera* R. Br.

DOODIA KUNTHIANA Gaud. Voy. Freyc. Bot. 401. 1829

Doodia media Hilleb. Fl. Haw. Is. 584. 1888. Not R. Br.
Doodia media var. C. Chr. Ind. Fil. 242. 1905.

TYPE LOCALITY: Hawaiian Islands.

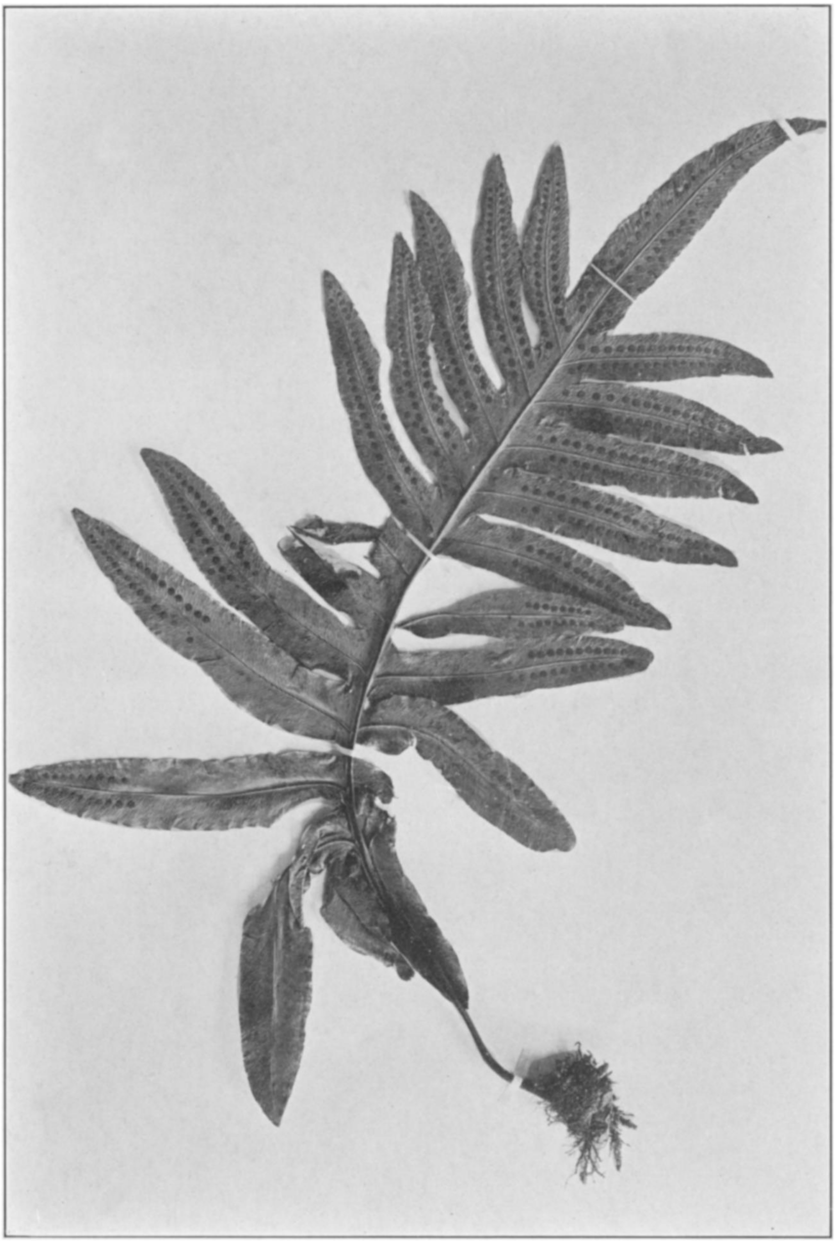
DISTRIBUTION: Common on banks of streams or in wet woods at 500–900 m. altitude; Hawaiian Islands.

ILLUSTRATION: Gaud. Voy. Freyc. Bot. *pl. 14*.

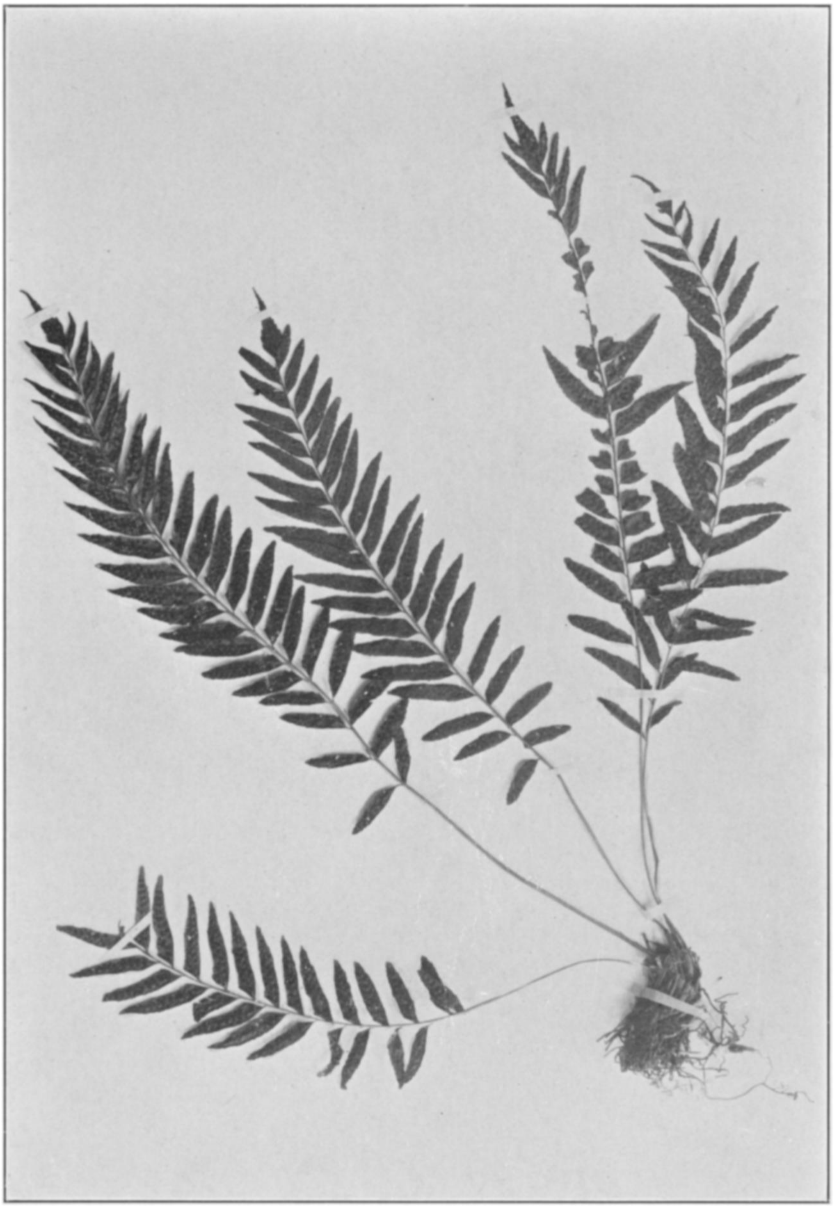
SPECIMENS EXAMINED: Hawaii, *Robinson 230* V; *241* V; Maui, *Robinson 305* V; *318* V; *350* V; Oahu, *Baldwin* N; *Macrae* B; *Robinson 74* V; *Safford 895* N; *Wilkes Expedition* N; Kauai, *Forbes* BM; *252* BM; *Heller 2601* C, N; *Van Ingen* C; *Robinson 803* V; *809* V; Hawaiian Islands, *Baldwin 26* B, C, N; *Baldwin 27* B, C; *Gaudichaud* B, C; *Miss Sessions* C; ex Herb. J. Donnell Smith N.

This species has been confused by Hillebrand and others with *D. media* R. Br. (type from Australia), the lower pinnae of which become reduced to small triangular auricles. It is safer to maintain the species as distinct under Gaudichaud's name. An allied species with widely spaced pinnae, collected in the Fiji Islands by Capt. Wilkes, is mentioned by Brackenridge (Fil. U. S. Expl. Exp. 138. 1854) as a "var. B."

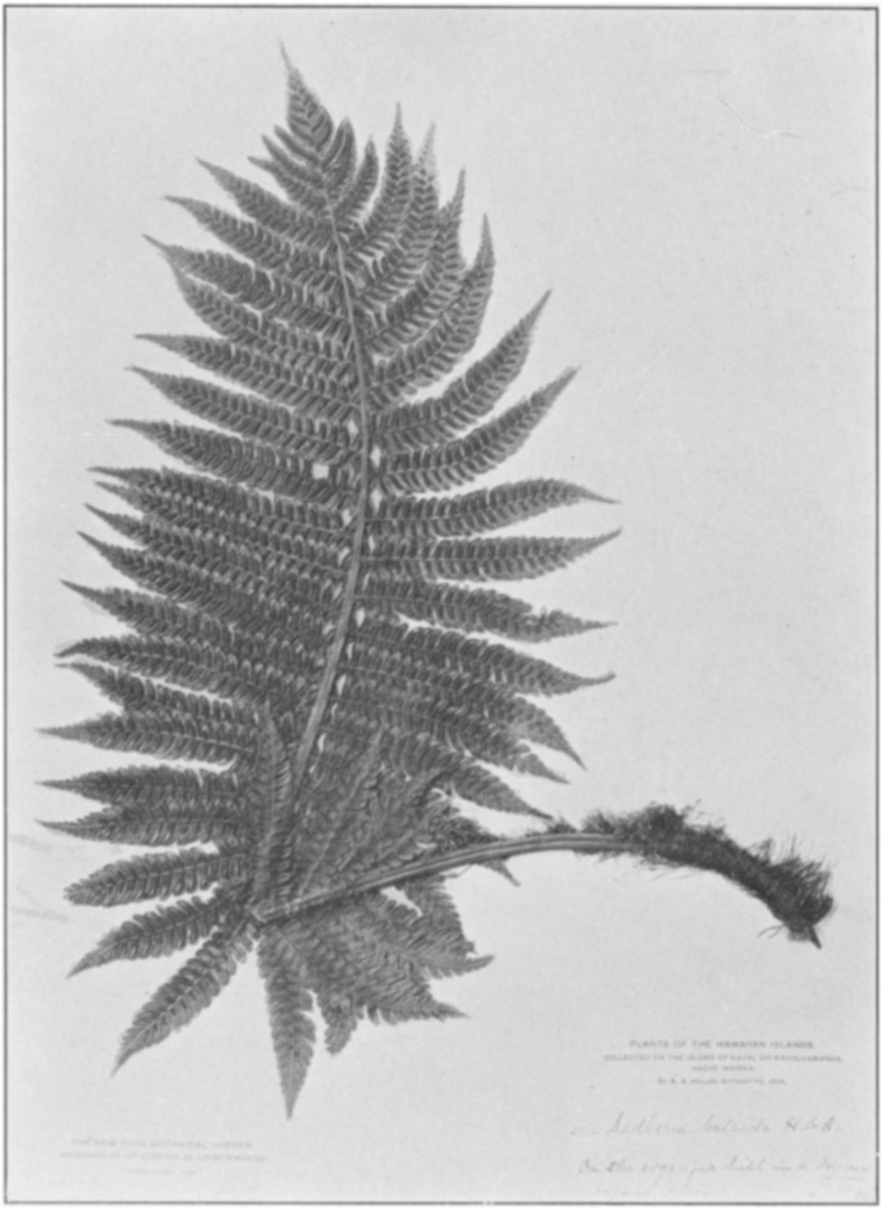
Mr. C. N. Forbes's *D. Kunthiana* var. *depauperata* (*252* BM), collected "on rocky ledges along the main Wahiawa," is so much smaller than the other plants of *D. Kunthiana* as to have an entirely different appearance. However, as to the form of the leaf, pinnate below, pinnatifid in the upper half, and the form of the linear-lanceolate scales, they are similar. These small plants are fine fruiting condition.



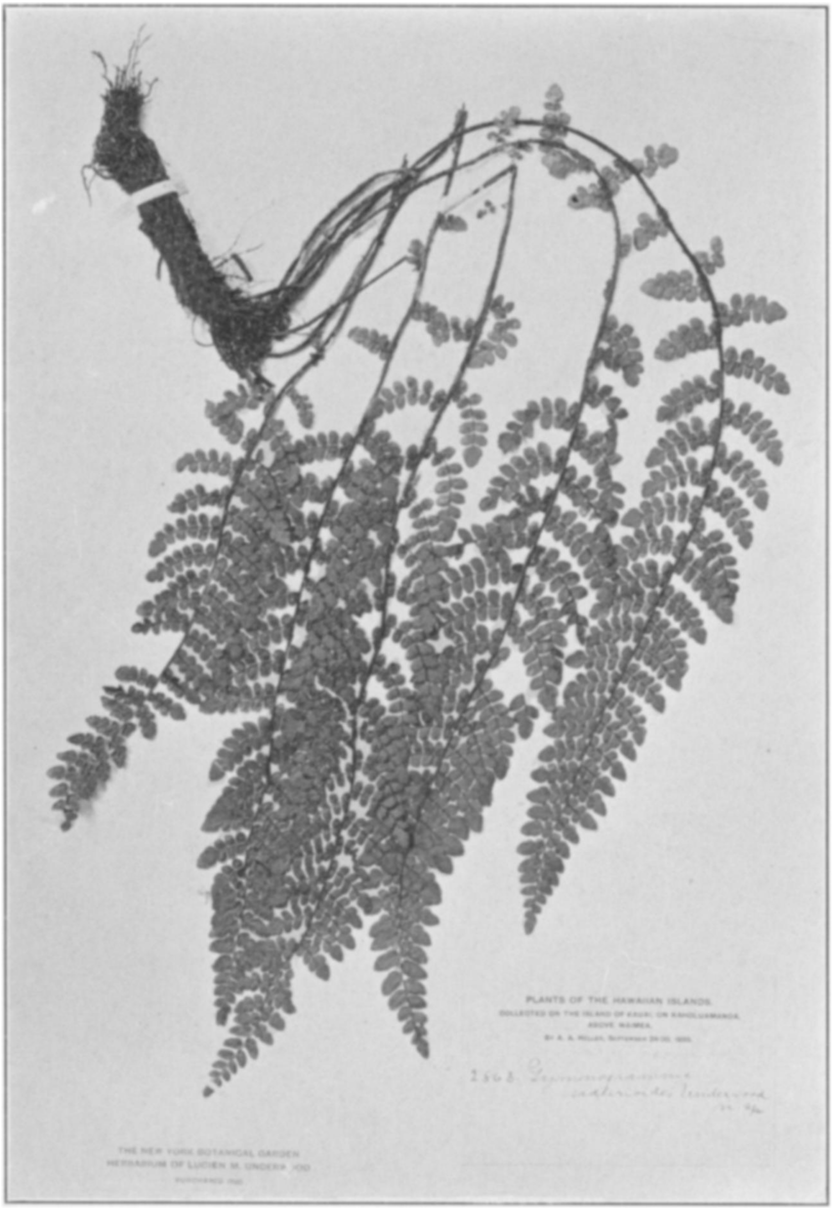
PHLEBODIUM AUREUM L.



CYRTOMIUM BOYDIAE (D. C. EATON) W. J. ROBINSON



SADLERIA HILLEBRANDII W. J. ROBINSON


PLANTS OF THE HAWAIIAN ISLANDS
THE NEW YORK BOTANICAL GARDEN
HERBARIUM OF LUCIEN M. UNDERWOOD

SADLERIA UNISORA (BAKER) W. J. ROBINSON